



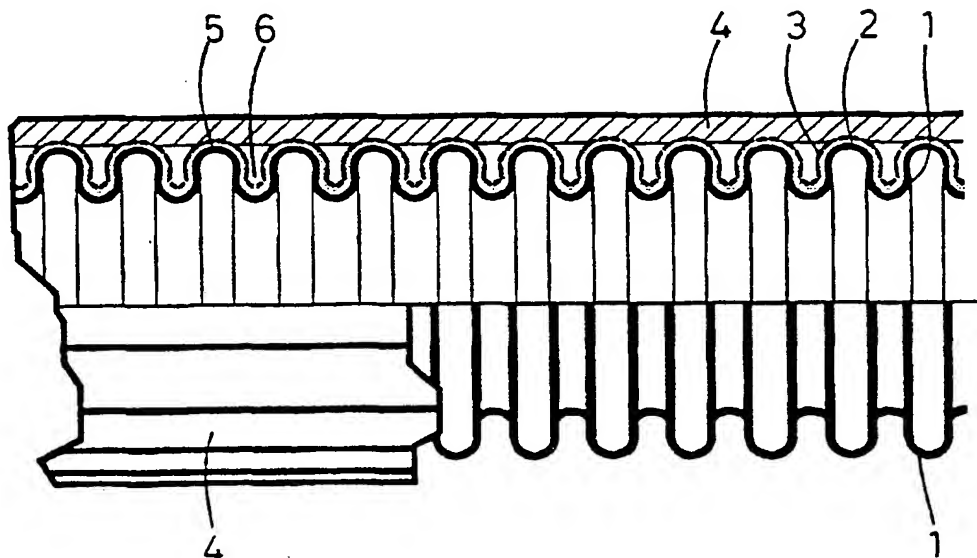
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(54) Title: **FLUID LINE**

(57) Abstract

A line for conveying fluids comprises a metal tube (1) and a plastic cover (4). The metal tube is formed of flexible corrugated tubing (1). The plastic cover (4) is disposed on the metal tube by extrusion, wherein the cover is attached to the top of the corrugations of the metal tube by an adhesive layer (3). The spacings between the corrugations in the wall of the tube remain free. Between the adhesive layer and the metal tube, an epoxy layer (2) is provided. In this way, a fluid line is obtained which is well secured, easily transportable and installable, and which can be used underground.



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Fluid line

The present invention relates to a line for conveying fluids, comprising a metal tube and a plastic cover.

Such a line is for example used in underground line systems for conveying fluids. These lines have the
5 disadvantage that they are made up of a plurality of rigid tubing pieces which have to be interconnected by couplings and have to be bent in situ by a bending machine to obtain the proper layout of the line. This involves considerable costs.

It is an object of the invention to provide a line of
10 the type mentioned in the preamble in which this disadvantage is removed in an effective way.

For this purpose, the line according to the invention is characterized in that the metal tube is formed of flexible corrugated tubing.

15 By using flexible metal tubing, a line section of great length can be supplied and transported to the area of use as a coil, which simplifies the installation of the line considerably and also makes it cheaper. Bends in the line can easily be provided, while in the case of subsidence or other
20 forces on the line, it will more readily adapt in shape, thereby reducing the risk of rupture. The plastic cover protects the flexible metal tubing against mechanical and chemical influences from outside, thereby permitting the use of the line in chlorine containing surroundings, such as sea
25 water. The metal tubing permits the conveyance of fluids for which metal is prescribed in view of permeability, such as is the case with many chemicals and for which reason a tube entirely made of plastic cannot be used.

In a special embodiment, the plastic cover is
30 disposed onto the metal tube by extrusion, wherein the cover is preferably attached to at least the top of the corrugations of the corrugated metal tube by an adhesive layer. Preferably, the spacings between the corrugations remain free. The corrugations in the wall of the metal tube may be ring-shaped
35 or helical.

The adherence of the plastic cover to the top of the corrugations of the metal tube has several advantages. First of all, it counteracts any lengthening of the metal tube under

pressure. Furthermore, in the case of an embodiment having ring-shaped corrugations in the wall of the metal tube, compartments are created when there is a leak from the inside. This prevents the fluid from escaping further. In a helical
5 tube, on the other hand, a leak can be detected at the end thereof by measuring the pressure in the space between the metal tube and the plastic cover. This may be used for automatic signalling in the case of a leakage. The adherence of the plastic cover to the metal tube may be enhanced further
10 by disposing an epoxy layer between the adhesive layer and the metal tube.

The invention will now be further elucidated with reference to the drawing of which the only figure shows an embodiment of the line according to the invention: partially
15 in side view (below left), partially in side view without plastic cover (below right) and partially in longitudinal section (above).

The drawing schematically shows the exemplary embodiment of the fluid line which is formed of a flexible
20 corrugated metal tube 1, an epoxy layer 2 disposed thereon, an adhesive layer 3 disposed over it and finally a plastic cover 4. For the sake of clarity, the epoxy layer 2 and the adhesive layer 3 are illustrated relatively thicker.

The tube 1 may be made from different metals, such as
5 inconel, stainless steel, bronze etc., depending on the respective application and the fluid to be conveyed. In the present case, the metal tube 1 comprises parallel ring-shaped corrugations 5 with intermediate ring-shaped spacings 6. Alternatively, one or more helical corrugations may be formed
10 in the wall of the tube 1.

The epoxy layer 2 and the adhesive layer 3 are preferably disposed on the inner tube 1 by spraying, wherein the epoxy layer serves to enhance the adherence of the adhesive layer 3. In the case of a thicker epoxy layer, a very
15 good corrosion protection is provided as well, which ensures a better preservation of the whole line. The adhesive layer 3 is intended for the attachment of the plastic cover 4 on top of the corrugations 5 of the metal tube 1, through which adherence the plastic cover 4 counteracts a deformation of the
20 corrugated tube 1 in longitudinal direction when the fluid

within the tube 1 is under pressure.

The plastic cover 4 may for example be made of hd, md or ld polyethylene, polypropylene or PVC. Other plastics are conceivable as well, as long they satisfy the requirements of mechanical strength, flexibility, corrosion resistance and extrudibility.

The flexibility of the composite line is still sufficient for the line to be easily bent. Because the spacings 6 between the corrugations 5 of the tube 1 remain free from the plastic of the cover 4, the flexibility is improved. A loose inner tube can be inserted into the metal tube 1 if a double-walled metal tube is prescribed. Connecting couplings can conveniently be mounted on the outer side of the line, with the plastic cover having a sealing function.

The line described hereinbefore and shown in the drawing is suitable for various uses. Because of the metal tube, all kinds of chemicals and gas-like or liquid fluids of chemical and petrochemical industries may be conveyed by the line. Due to the plastic cover 4, this conveyance may take place underground since the cover offers a good protection against corrosion and mechanical influences. The line according to the invention is also very suited for large underground line systems, such as gas lines and lines in sea water environments. The flexibility considerably simplifies the transport and installation of the line compared to rigid line sections.

The invention is not restricted to the embodiment shown in the drawing and described hereinbefore, which may be varied in different manners within the scope of the invention.

CLAIMS

1. Line for conveying fluids, comprising a metal tube (1) and a plastic cover (4), characterized in that the metal tube is formed of flexible corrugated tubing (1).

2. Line according to claim 1, wherein the plastic
5 cover (4) is disposed on the metal tube by extrusion.

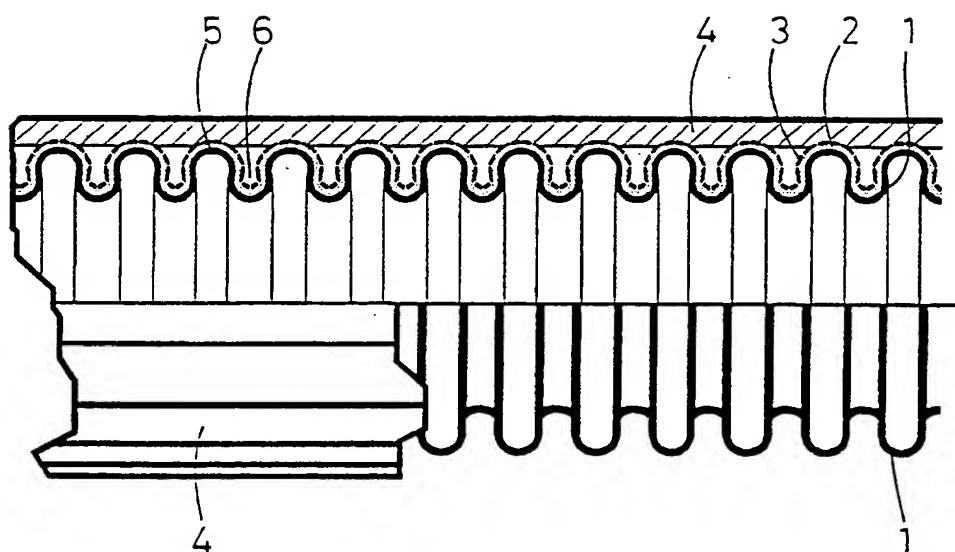
3. Line according to claim 1 or 2, wherein the cover (4) is attached to at least the top of the corrugations (5) of the metal tube (1) by an adhesive layer (3).

4. Line according to claim 1, 2 or 3, wherein the
10 spacings (6) between the corrugations (5) in the wall of the tube (1) remain free.

5. Line according to one of claims 1-4, wherein the corrugations (5) in the wall of the metal tube (1) are ring-shaped or helical.

15 6. Line according to one of claims 3-5, wherein an epoxy layer (2) is disposed between the adhesive layer (3) and the metal tube (1).

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INTERNATIONAL SEARCH REPORT

International Application No

PCT/NL 94/00244

A. CLASSIFICATION OF SUBJECT MATTER
IPC 6 F16L11/15 F16L9/147 F16L58/10

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 6 F16L

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	FR,A,1 075 364 (THE CONNECTING HARD RUBBER COMPANY) 15 October 1954 see the whole document ---	1,5
A	DE,C,816 465 (HENSCHEL & SOHN GMBH) 11 October 1951 see the whole document ---	1,5
A	GB,A,921 601 (POWER AUXILIARIES LTD) 20 March 1963 see page 1, line 71 - page 2, line 18; figures 1,2 -----	1

☐ Further documents are listed in the continuation of box C.☒ Patent family members are listed in annex.

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Information on patent family members

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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
FR-A-1075364		NONE	
DE-C-816465		NONE	
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